TVA Kingston Ash Recovery Project
Roane County, TN

Project Update/Long-Term Monitoring Plan

May 2013

Overview

- Phase 2 Construction Update
  - Ash Excavation
  - Ash Stacking
  - Perimeter Wall Stabilization
  - Cap and Cover
- Update on Lakeshore Restoration
- Long Term Monitoring Plan for River System (Phase 3)

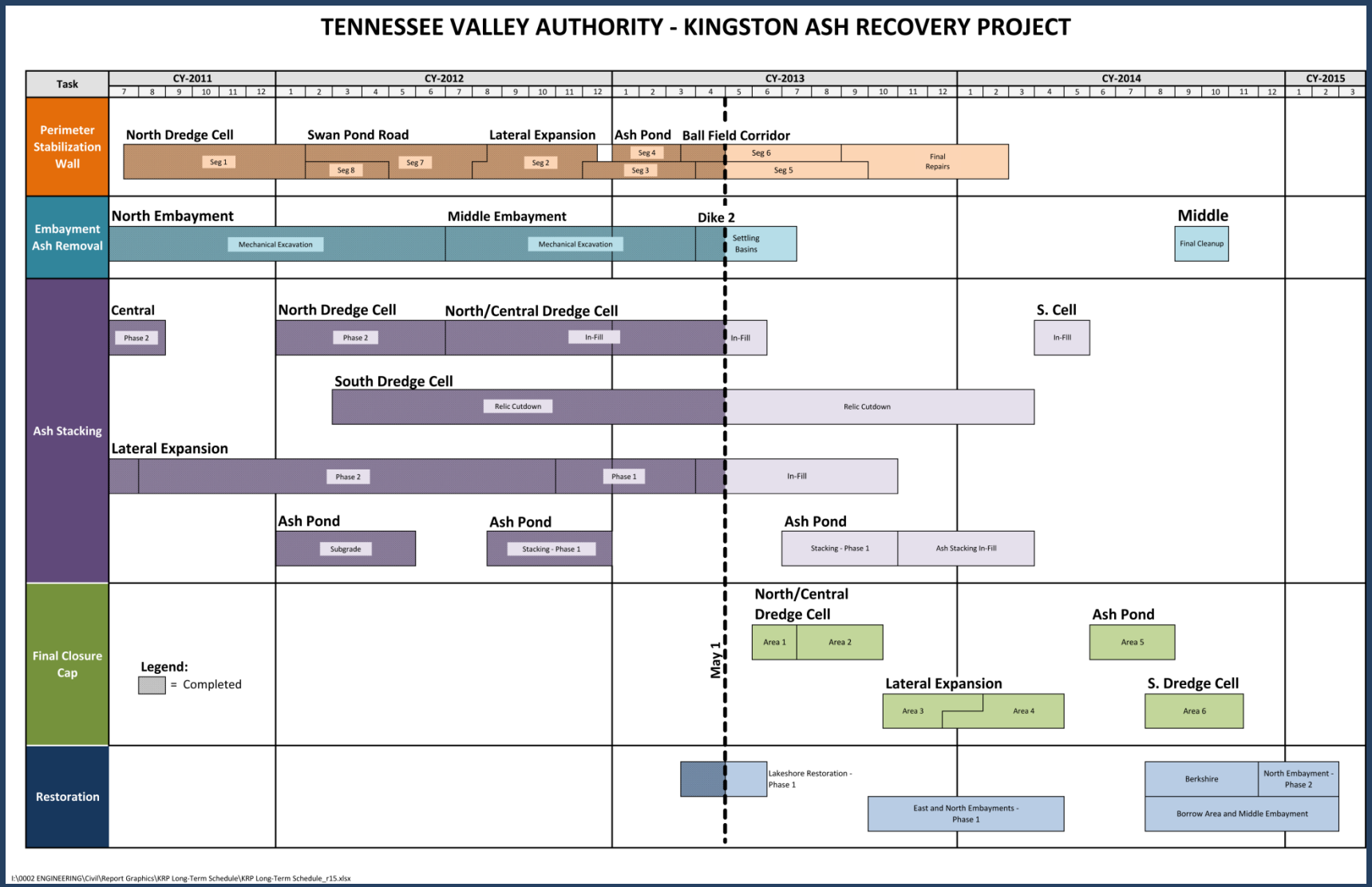
CERCLA Removal Action Strategy

- 3.5 million CY removed
- 4 million tons disposed at Perry County, AL
- Emory River reopened May 29, 2010

- 2.8 million CY (north and middle embayment)
- Consolidating in reinforced, on-site disposal area
- Perimeter wall designed to withstand earthquake forces

- Address remaining ash in the river system
- River ecosystem & human health risk assessments
- Long-term monitoring

Project Schedule



Mechanical Excavation

- East Embayment
  - Up to 7,500 CY/day productivity
  - 0.75 million CY excavated
  - June 2009 – May 2010 (11 months)
- North Embayment
  - Ave 5,600 CY/day productivity
  - 1.0 million CY excavated
  - November 2010 – November 2011 (13 months)
- Middle Embayment
  - Ave 2,600 CY/day productivity
  - December 2012 – June 2013 (17 months)
  - 94 % Completed (1,173,844 CY removed)
  - 6% remaining (70,987 CY left)
  - Dike 2 – 180,000 CY (underway)

Excavation Finished June 2013

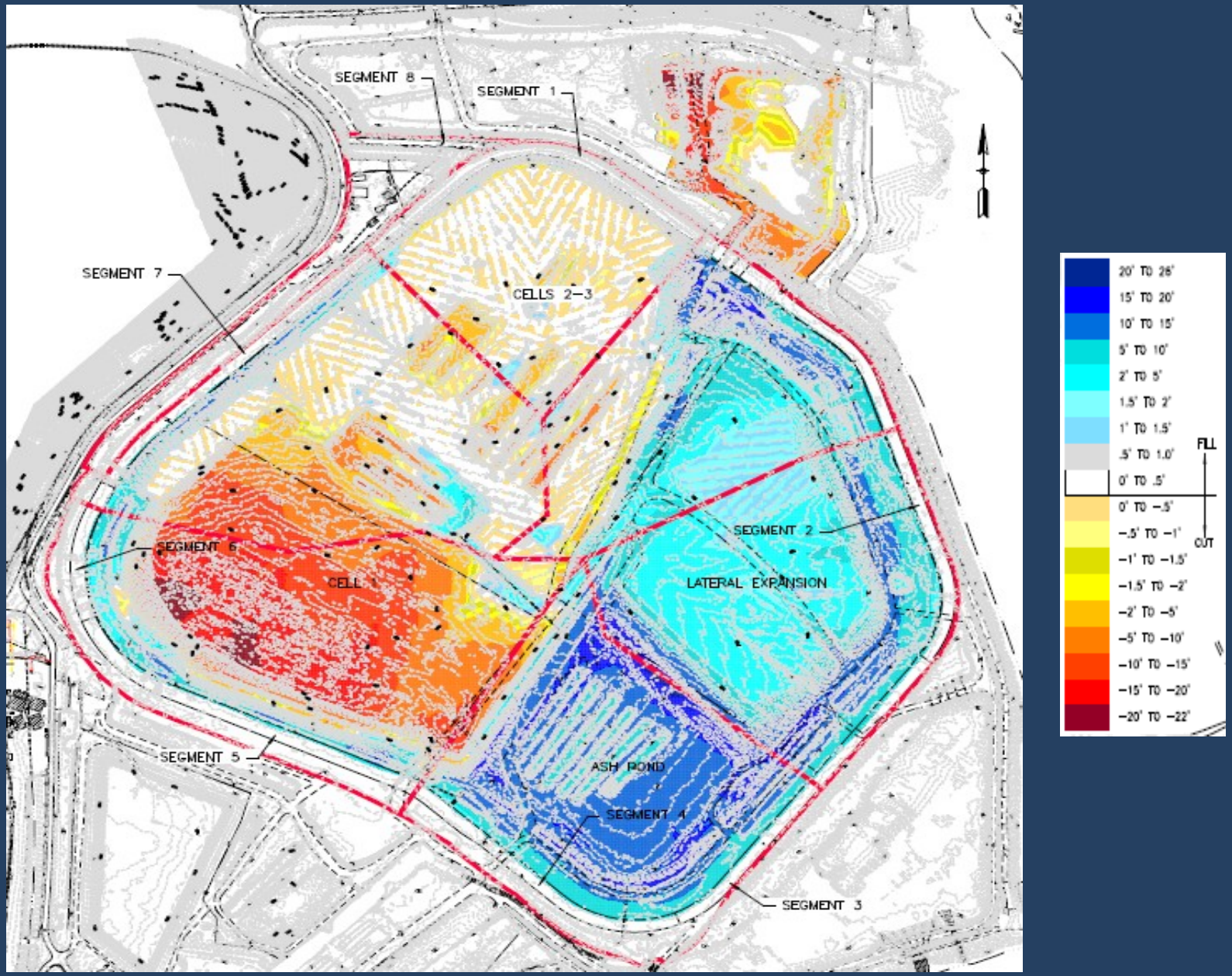
(3.0 million cubic yards)

Ash Stacking

- "Loose" Volumes Placed/Remaining

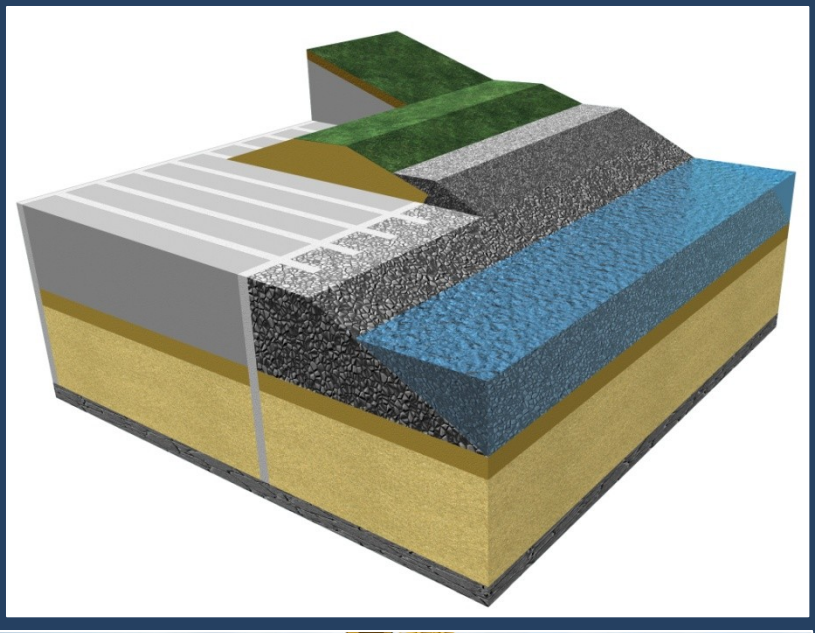
- Dredge Cell = 2,247,000 /80,000 CYs
- Lateral Expansion = 1,090,000 /867,000 CYs
- Ash Pond = 230,000/772,000 CYs
- Total Ash Placed = 3,567,000 CYs
- Total Ash Remaining = 1,842,000 CYs
- 66% Completed

Dredge Cell Cut & Fills



Perimeter Wall Stabilization

- Designed to withstand earthquake magnitudes
- Cement slag & bentonite self-hardening slurry; 200 - 285 PSI Wall Strength
- Walls tied into bedrock, up to70 ft deep
- 12,000 linear feet of wall, 60,000 linear feet of trenches; 500,000 cubic yards of slurry
- Productivity to date (700 – 1200 cy/day)
- Repairs: cold joints, inclusions due to sloughing
- 85% complete; finish early 2014



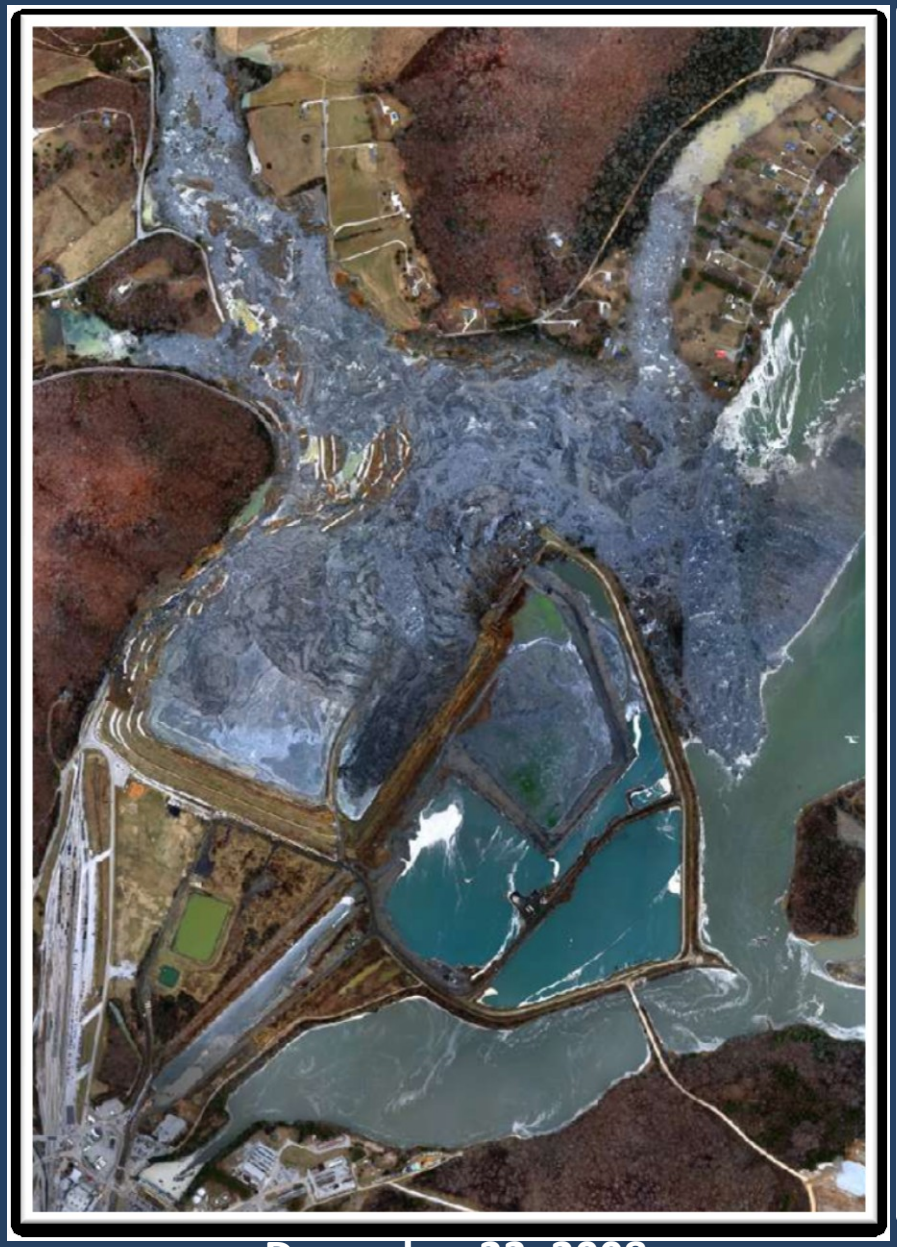
Cap and Cover

- Cap Design
  - Ash Subgrade
  - 40 mil HDPE liner
  - Drainage Layer
  - 2 feet of clay/topsoil
  - Vegetative Cover
- ≈ 230 acres total

AREAS		
I	1,084,479	SF
II	1,782,544	SF
III	1,370,497	SF
IV	1,685,047	SF
V	1,776,788	SF
VI	1,994,624	SF
VII	377,328	SF

- Area 1 cap placement to start June 11th

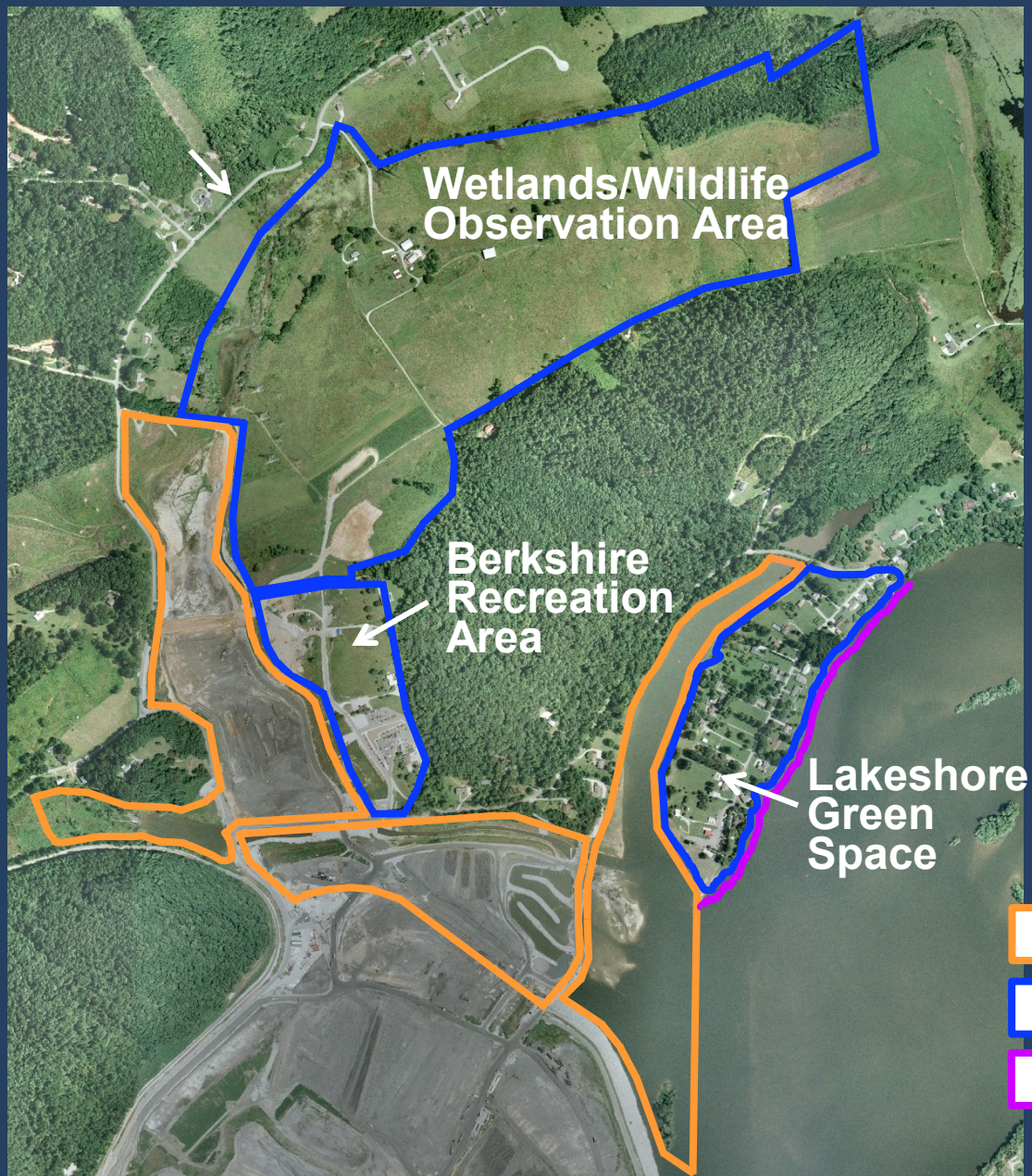
4 1/2 Years of Recovery



December 23, 2008

May 1, 2013

Swan Pond Embayment Restoration & Recreation



- Embayment restoration
- Recreation Areas
- Wetlands/wildlife observation area

Swan Pond Embayment Restoration & Recreation

- **Phase 1 – Lakeshore Park**
  - **Construction underway**
  - **Walking trails, fishing piers & restroom**
  - **Completed August**
- **Phase 2 – Lakeshore Park/Middle Embayment**
  - **Boat ramp, walking bridge, trails & Middle Embayment to start this Fall**
  - **Berkshire Recreation Area to begin Summer/Fall of 2014**

Long Term Monitoring Plan Overview

A Sampling and Analysis Plan (SAP) to monitor residual ash left over from Phase 1 dredging.

≈ 510,000 CY of residual ash over 200 acres of the lower Emory and Clinch Rivers.

A major component of the Phase 3 Monitored Natural Recovery Action Memo approved by EPA/TDEC on November 12, 2012.

5 Years of Proposed Long-Term Monitoring Includes:

- Sediment transport modeling
- Sediment quality
- Sediment toxicity
- Benthic macroinvertebrates
- Tree Swallows
- Fish

Sediment Transport Modeling

- 2 Dimensional Sediment Transport Modeling
  - Conducted by US Army Corps of Engineers (Engineering Research and Development Center) during Phase 3 effort
  - Predicted natural sedimentation, burial and mixing would meet cleanup goals in 10 to 15 years
  - Storms > 10 year interval (flow >110,000 CFS) tend to scour and mobilize surface sediments

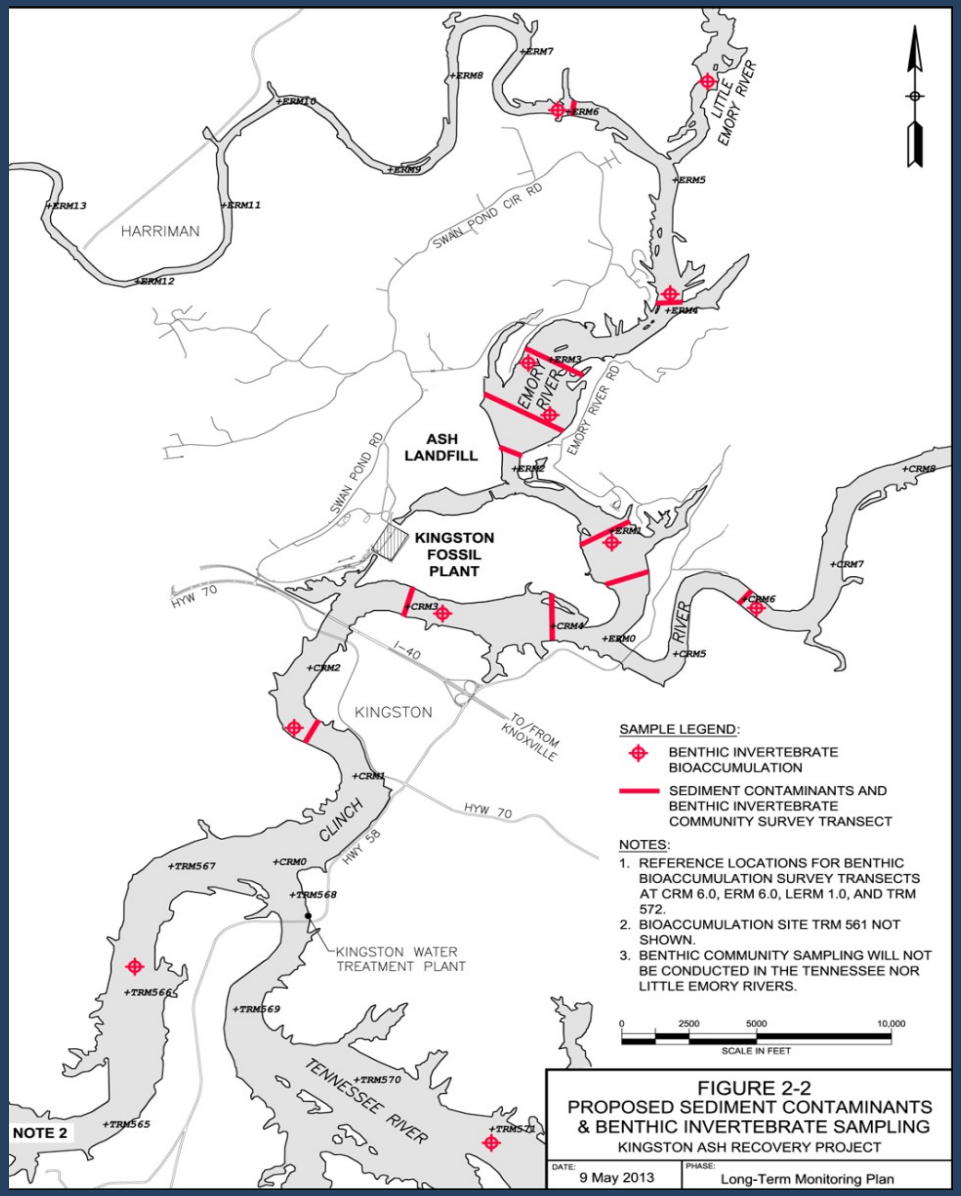
- Update with new, higher resolution bathymetry
  - Collected on 200 foot intervals from ERM 5.0 to CRM 2.0

- Model will be re-run when > 10 year storm occurs
  - Sediment cores collected in depositional areas to ground truth (calibrate)

- If 10 year storm does not occur over 5 year period, model will be re-run in 2017

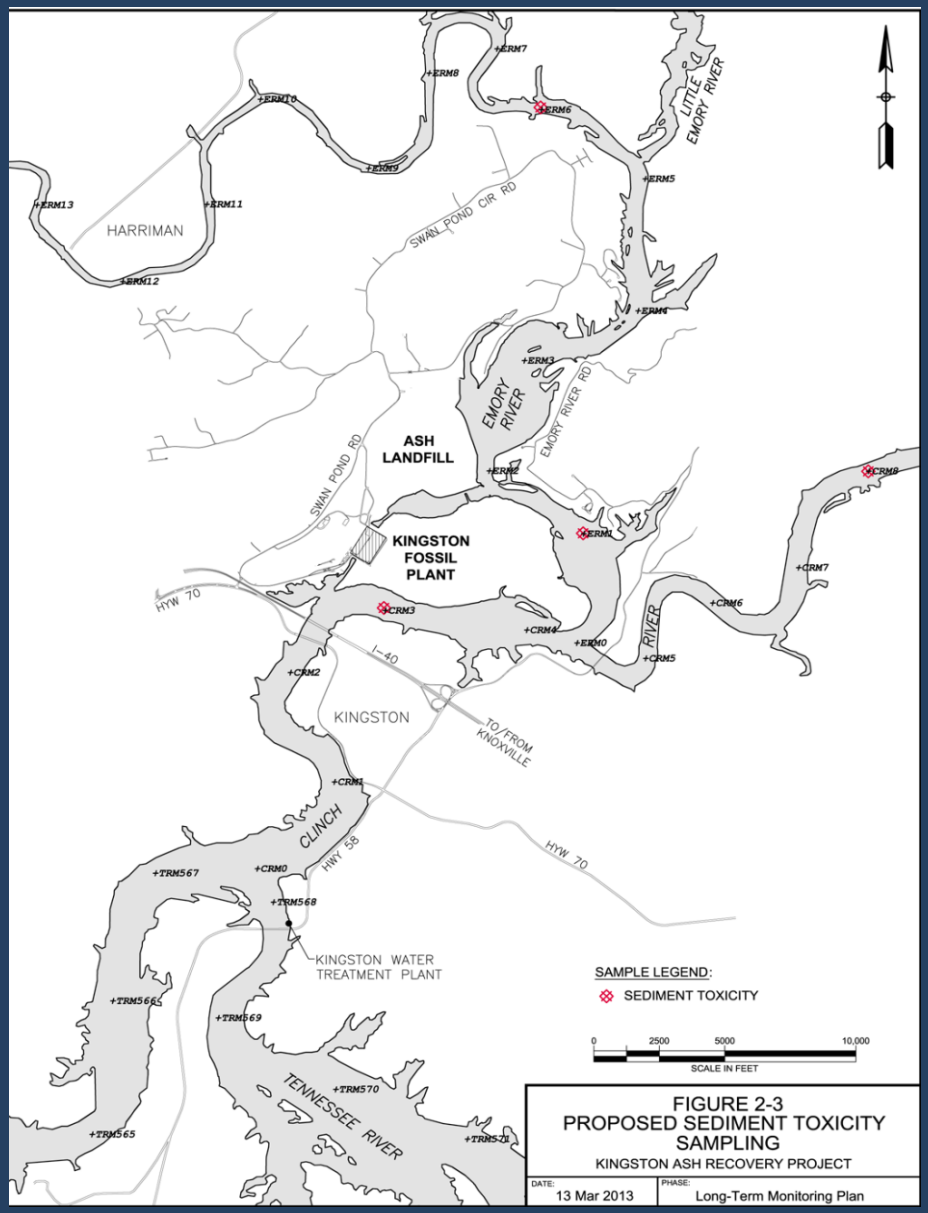
Sediment Quality Sampling

- Measure progress towards meeting sediment cleanup goals for Arsenic (29-41 mg/kg) and Selenium (2.8 to 3.2 mg/kg)
- Total of 11 sample transects
  - Will be combination of grabs and composites
- Annually at 2 Transects
  - ERM 1.0 and ERM 0.7
- Biennially in 2013, 2015, and 2017
  - 4 Transects on Emory River
  - 3 Transects on Clinch River
  - 1 Emory River Reference
  - 1 Clinch River Reference



Sediment Toxicity

- Laboratory exposure testing with an amphipod (*Hyallela Azteca*)
- 10 day bioassays for growth and survival
- Conducted at 4 locations in 2013 and 2017
  - ERM 1.0
  - Emory River Reference
  - CRM 3.0
  - Clinch River Reference



Benthic Macroinvertebrates

- Includes bioaccumulation and community surveys
  - Generally co-located with transects for Sediment Quality monitoring
  - Measure progress towards meeting Tissue Monitoring Endpoints for adult/larval mayflies (food for tree swallows/killdeer)

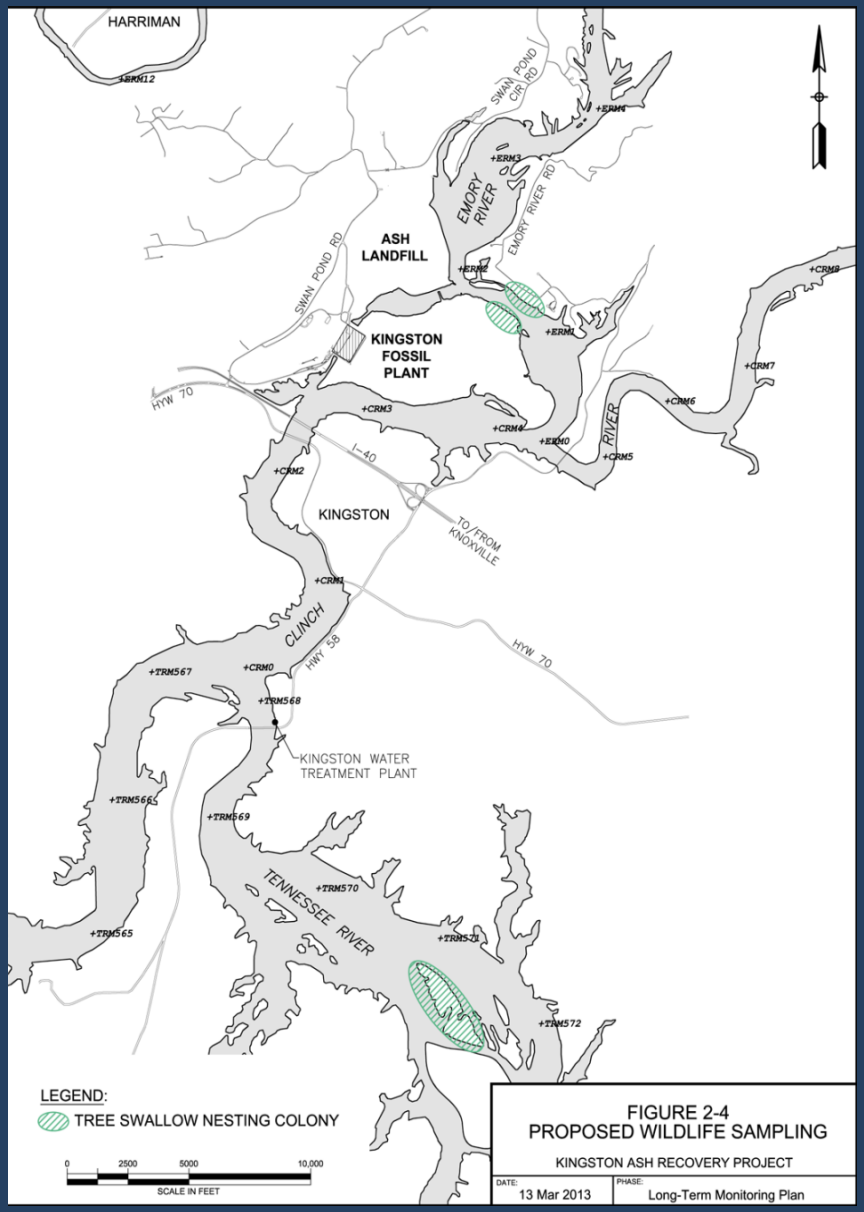
- Larval mayflies at 12 locations
  - Annually at ERM 1.0
  - Biennially in 2013, 2015 and 2017
    - 4 stations in Emory River
    - 2 stations in Clinch River
    - 2 stations in TN River
    - 4 reference stations (Emory, Clinch, Little Emory, Tennessee)

- Snails at 10 locations in 2013

- Benthic Community Surveys (Abundance/Diversity)
  - 11 stations co-located with sediment samples
  - Annually at ERM 1.0 + ERM 0.7/Biennially in 2013, 2015 and 2017 for other 9

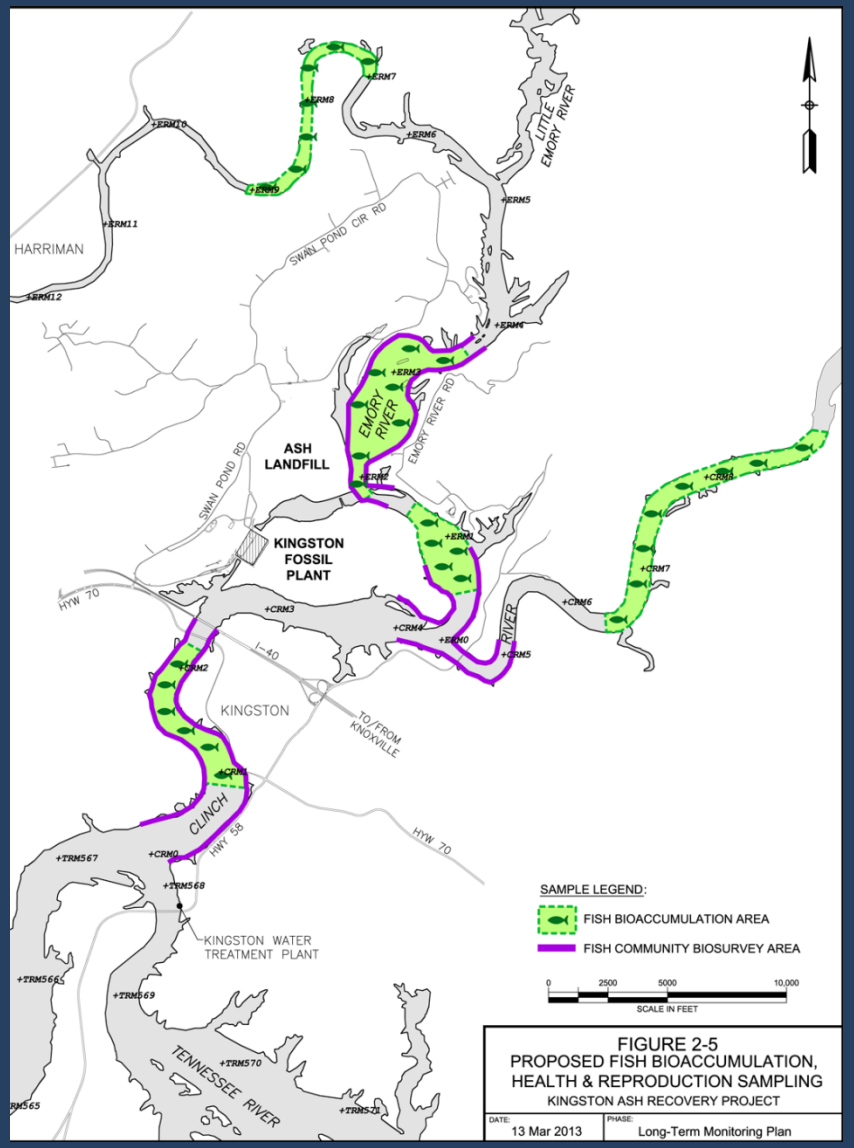
Tree Swallows

- Annually at 2 Stations
  - ERM 1.0
  - TNM 572 (reference)
- Bird Boxes
  - Egg shells analyzed
  - Egg contents analyzed
- Biosurveys for clutch size, hatching success and 15-day hatchling survival

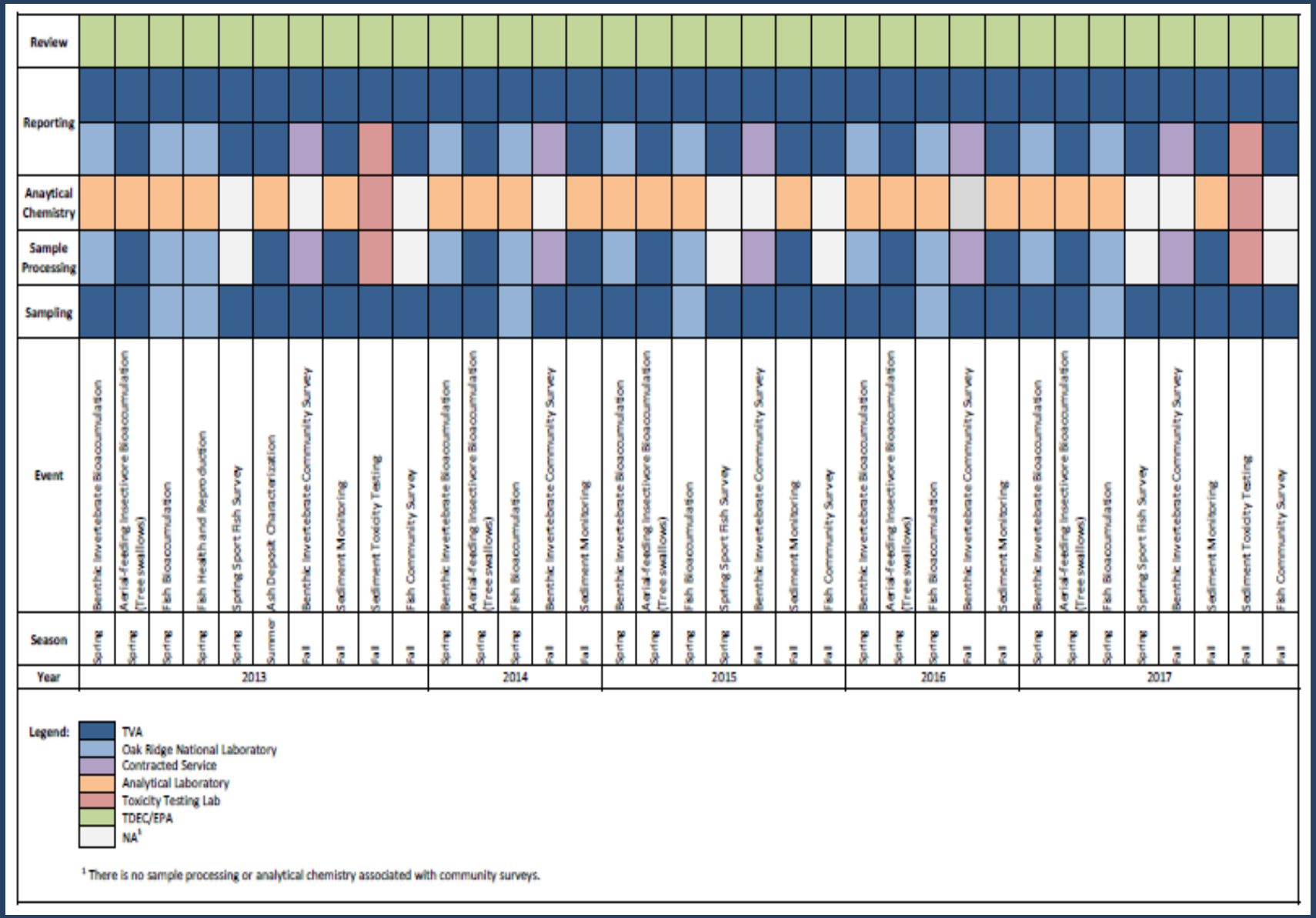


Fish Bioaccumulation/Biosurveys

- Biennially in 2013, 2015 and 2017 for bluegill, largemouth bass and redear sunfish
  - 3 locations in Emory River
  - 2 locations in Clinch River
- Annually at ERM 1.0
- Fish health and reproductive metrics in 2013 by ORNL
- Fish community and biosurveys biennially in 2013, 2015 and 2017
  - 3 reaches in Emory and Clinch Rivers
  - Abundance, diversity, richness, and physical condition



Long Term Monitoring Summary



Summary and Conclusions

- **River System Long Term Monitoring Plan available for review at:**
  - **www.epakingstontva.com**
  - **www.tva.gov/kingston**
- **Site Tours conducted 4th Tuesday of the Month**
  - **10 to 11 am; Start at the Overlook area off Swan Pond Road**
  - **Email Bob Pullen (RPPullen@tva.gov)**
- **Revised Community Involvement Plan forthcoming**
- **QUESTIONS? (Zeller.Craig@epa.gov)**